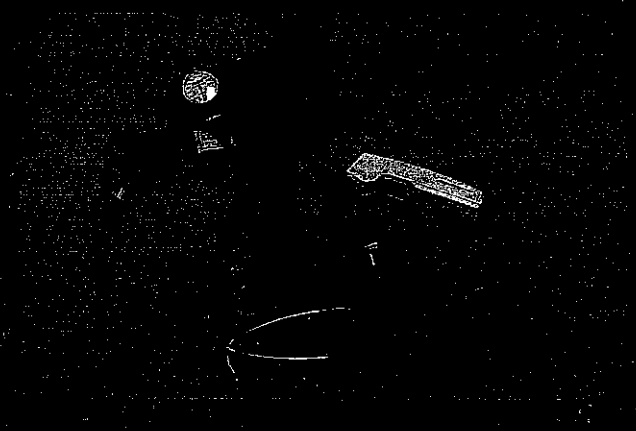
CHAPTER 11

Vital Signs Assessment



OBJECTIVES

After completing this chapter, you should be able to do the following:

1. Define and correctly spell each of the key terms.
2. Accurately measure and record the four vital signs.
3. Accurately measure and record a person's height and weight.
4. Identify several abnormal respiratory patterns.
5. Recognize the signs of shock.

KEY TERMS

* blood pressure
* core temperature
* homeostasis
* pulse
* respiration
* vital signs

THE VITAL SIGNS

The human body is an amazing system. As human beings, one of the abilities we possess is the ability to maintain a relatively constant internal environment by compensating for changes that occur in either the internal or external environment. This complex balancing act is achieved through the adaptation of various body systems to changes that occur. The process of maintaining this balance, known as **homeostasis**, is constant. Areas of the brain monitor conditions in the body at all times. When certain changes are detected, a response from the appropriate body system is stimulated. For example, if a low oxygen level is detected, the rate of breathing will increase until the amount of oxygen necessary for proper body function is achieved. Other homeostatic mechanisms include the regulation of body temperature and blood pressure.

homeostasis
a state of equilibrium within the body maintained through the adaptation of body systems to changes in either the internal or external environment.

The body systems function optimally within a relatively narrow range of conditions. This is why homeostasis is so important. When illness or injury occurs, the body's ability to maintain homeostasis can be impaired. Therefore, as a health care worker, it is essential to understand the signs of normal and abnormal body functions. **Vital signs** are used to assess the conditions of the various body systems, particularly the respiratory and circulatory systems. These signs will change as the body reacts to an injury or illness. The four basic vital signs are the pulse, respiration, blood pressure, and temperature. It is important to become skilled in the procedures for obtaining each of these vital signs. It is equally important to be able to communicate findings to a supervisor and others accurately by recording the results on the proper forms, using the correct terminology and abbreviations.

vital signs
assessments of pulse, respiration, blood pressure, and temperature; body functions essential to life.

NOTE:
During routine care, gloves are not usually worn unless there will be exposure to blood or other body fluids, or to broken skin, including open lesions. When in doubt, put on appropriate protective wear.

PULSE

The blood vessels expand and contract every time the heart beats. The blood flows through the vessels, and waves of blood cause a rhythmic throbbing in the arteries. This throbbing can best be felt by placing the fingertips over one of the large arteries that lie close to the skin and next to a bone. Veins are the blood vessels that carry blood from the body to the heart; arteries are the vessels that carry blood away from the heart to the rest of the body. This is why a pulse can only be felt in an artery.

pulse
a vital sign; a quantitative measurement of the heartbeat using the fingers to palpate an artery or a stethoscope to listen to the heartbeat

The **pulse** reflects the condition of the patient's circulatory system and cardiac function. Therefore, changes in the pulse indicate a change in the patient's status. For example, a rapid but weak pulse may indicate shock, bleeding, diabetic coma, or heat exhaustion, while a rapid and strong pulse may indicate heatstroke, severe fright, or hypertension. A patient with a strong and slow pulse may have experienced a skull fracture or a stroke. The absence of a pulse indicates cardiac arrest or death. (See Chapters 17, 19, and 20 for more information on shock, heat exhaustion, and diabetic coma.)

Taking a pulse requires accurate counting and sensitivity to rhythms and quality. Pulse rates vary with the size of the patient, physical condition, and age, and are recorded in terms of beats per minute (bpm). The normal pulse rate for an adult is 60 to 100 beats per minute, with the average heart rate being 70 to 80. Rates higher than 100 are known as tachycardia, and rates below 60 are called bradycardia. In a trained athlete, the resting pulse will be lower (50–60 bpm) because the heart muscle receives more exercise. In this case, the lower pulse is not bradycardia, but rather a normal pulse rate for someone who is in good cardiovascular health. Exercise allows the heart to become stronger and more efficient, sending more oxygenated blood through the body with each beat.

The rhythm of the pulse is described as *regular* or *irregular*. Quality refers to the strength of the pulse, and is noted as *weak, strong*, thready (weak and rapid), or bounding (unusually full and strong). When noting the pulse on a medical or designated form, be sure to indicate the rate, the regularity of the rhythm, and the strength or quality.

The pulse can be felt in many places on the body, but one of the most common locations for obtaining the heart rate is near the radius, one of the bones in the wrist. This pulse is known as the radial pulse. Another common pulse site is the carotid pulse, located on the carotid artery in the neck. In an emergency the pulse rate should be recorded and the information given to a more qualified health care provider at the earliest opportunity. If a pulse is not detected, the EMS should be activated, and cardiopulmonary resuscitation (CPR) must be started immediately. (See Chapter 13.)

MEASURING A RADIAL PULSE

Materials Needed:

* a digital watch or analog watch with a second hand
* gloves (if blood or other body fluids are present)

1. **Procedural Step:** Wash your hands if possible.

   Reason: Universal Precaution.

2. **Procedural Step:** Put on gloves if there is any blood or other body fluid present.

   Reason: Universal Precaution.

3. **Procedural Step:** If in a clinical setting, identify the patient or client by asking the person for the first and last name. Repeat the full name back to the patient.

   Reason: To make sure you are working with the correct person.

4. **Procedural Step:** Have the patient sit, stand, or lie down, according to

MEASURING A RADIAL PULSE

the medical condition. If the patient has recently changed position, wait a few minutes before taking the pulse.

Reason: This allows the heart rate to adjust to the patient's shift in position.

5. **Procedural Step:** Tell the patient what you are going to do using terms the patient can understand.

Reason: This keeps the patient calm and provides the patient with necessary information to give informed consent.

6. **Procedural Step:** Place the palm of the hand downward. If the patient is lying down, rest the patient's forearm across the chest.

Reason: This position will help you count the patient's respirations, when you get to that assessment, without the patient being aware that breaths are being counted. Such awareness may alter the result.

7. **Procedural Step:** Place the pads of your first two fingers directly over the radial artery. Apply slight pressure.

Reason: The fingertips are sensitive and can feel the pulse, located on the inside of the wrist on the thumb side.

8. **Procedural Step:** Feel for the pulsations as the heart beats. Don't push too hard.

Reason: You could stop the blood flow and stop the pulse.

9. **Procedural Step:** Look at the second hand on your watch and begin counting. Ideally, the pulse should be counted for 1 full minute; however, if the pulse is regular it is acceptable to count for 30 seconds and multiply the number by 2.

Reason: This will give you the beats per minute quickly. The pulse rate is charted as the beats per minute.

10. **Procedural Step:** If the rhythm is irregular, then count it for a full minute.

Reason: It is possible to miss some heartbeats by not counting an irregular pulse for a full minute.

11. **Procedural Step:** When measuring a pulse rate, note the *rhythm* and *quality* of the beat as well.

Reason: Rhythm refers to whether the pulse is regular (doesn't change) or irregular (speeds up and/or slows down). Quality refers to the strength of the pulse. A weak, thready pulse may indicate shock, while a full bounding (strong) pulse could indicate high blood pressure.

12. **Procedural Step:** Remove and discard your gloves.

Reason: Universal Precaution.

13. **Procedural Step:** Wash your hands before providing care to another patient.

Reason: Universal Precaution.

(continues)

MEASURING A RADIAL PULSE (Continued)

14. **Procedural Step:** Record the rate, rhythm, and quality of the pulse in the designated place on the proper form.

Reason: To provide documentation.

15. **Procedural Step:** Immediately report any abnormalities to your supervisor or contact the EMS.

Reason: An abnormality may indicate a health problem.

Chart it like this: *P = 80, R/S* (regular & strong) or *P = 116, irreg/thready* (irregular, thready)

NOTE: Although the radial artery is the most common place for measuring the pulse rate, a pulse can be measured anywhere the pulsations of an artery can be felt.

MEASURING A CAROTID PULSE

Materials needed:

* a digital watch or analog watch with a second hand
* gloves (if blood or other body fluids are present)

1. **Procedural Step:** Wash your hands if possible.

Reason: Universal Precaution.

2. **Procedural Step:** Put on gloves if there is any blood or other body fluid present.

Reason: Universal Precaution.

3. **Procedural Step:** If in an inpatient setting, identify the patient or client by asking the person for the first and last name. Repeat the full name back to the patient.

Reason: To make sure you are working with the correct person.

4. **Procedural Step:** Tell the patient what you are

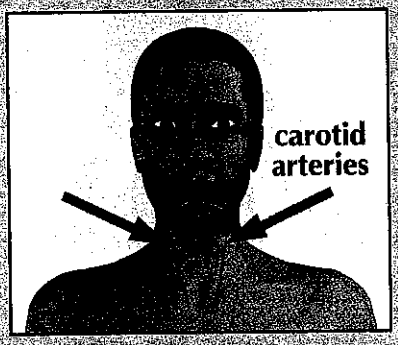
doing in terms the patient can understand.

Reason: This keeps the patient calm.

5. **Procedural Step:** Check the carotid artery on one side and then the other side. The carotid pulse is used to check for a pulse when cardiac arrest is suspected. Pressing on both carotid arteries at the same time could decrease the blood supply to the brain.

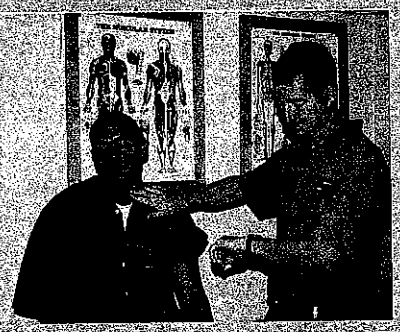
Reason: The carotid pulse is the closest point to the heart that can be easily detected without a stethoscope. It can still be felt when a patient may only have fainted. There will be no pulse on a patient in cardiac arrest. Patients who have experienced a stroke may have a carotid pulse on only one side.

MEASURING A CAROTID PULSE



6. **Procedural Step:** Use the pads of your first two fingers, and place them directly over one side of the front of the patient's neck. Check both the right and the left pulse for 5 to 10 seconds. If no pulse is felt, then begin cardiac compressions.

   Reason: This is how the carotid pulse is measured.



7. **Procedural Step:** Remove and discard your gloves.

   Reason: Universal Precaution.

8. **Procedural Step:** Wash your hands before providing care to another patient.

   Reason: Universal Precaution.

9. **Procedural Step:** Record your findings on the patient's chart.

   Reason: To provide documentation.

10. **Procedural Step:** Immediately report any abnormalities to your supervisor or contact the EMS.

    Reason: An abnormality may indicate a health problem.

    Chart it like this: *P = 62*

    NOTE: This pulse is generally used in emergency situations and for self-monitoring of the pulse during cardiovascular exercise, rather than for patient monitoring. Therefore, rhythm and quality are not usually noted for a carotid pulse.

There are many other places in the human body where the pulse may be felt (see Figure 12-1). Some of the more common pulse sites are listed below:

* **The temporal artery:** This artery is located on the face in front of the ear. Since this pulse may be difficult to locate, it is generally not used for a pulse rate.

* **The brachial artery:** This artery is found on the inside of the arm at the crease near the elbow. The pulse that is palpated at this location is used primarily for a blood pressure check.
* **The femoral artery:** Found in the right and left groin, this pulse is often used to check for circulation in the legs.
* **The popliteal artery:** This pulse is located behind the knee and, like the femoral artery, may be used to check for circulation in the legs.
* **The dorsalis pedis:** This pulse is located on top of the foot and is used primarily to check for circulation in the feet.

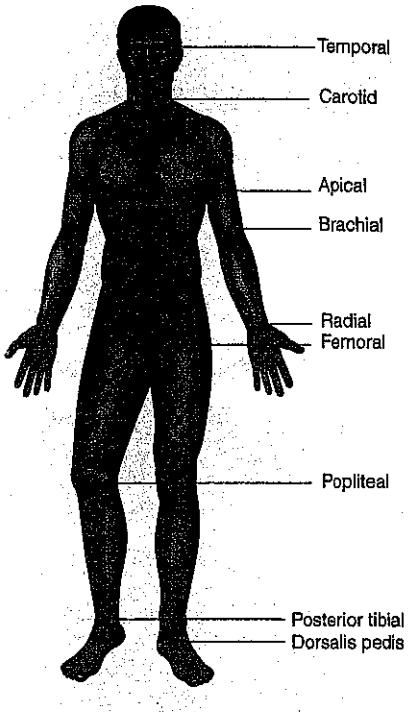


FIGURE 12-1 Pulse Sites

RESPIRATION

respiration
breathing: the process of bringing oxygen into the body and expelling carbon dioxide from the body.

Breathing, or **respiration**, is the process of bringing oxygen into the body where it can be utilized by the cells, and expelling carbon dioxide, which is eliminated as a waste product from the cells. This process is controlled by the brain and regulated by the changing carbon dioxide levels in the bloodstream. To allow air to enter and exit the body, the ribs, chest muscles, and diaphragm move spontaneously in response to messages from the brain.

Respiration provides the cells of the body with the energy required to perform their specific functions. This energy is obtained when food is metabolized (chemically altered) at the cellular level. The conversion of food to energy requires oxygen. Respiration provides this oxygen to each of the cells, via the bloodstream. When more energy is required by the muscle cells, such as during exercise, the rate of respiration increases. The normal rate of breathing can also be altered by excitement, drugs, and a number of disease processes (e.g., diabetes, kidney abnormalities, and heart and lung diseases). In addition, pain, fever, and trauma may also affect the breathing process. If breathing patterns are altered and the body is deprived of oxygen, serious damage can occur to the vital organs. The absence of respiration indicates a blocked airway or death.

A single respiration consists of one inspiration and one expiration. Use the following general guidelines for the normal rates of respiration:

* Age 15 and older: 15 to 20 breaths per minute
* A well-trained athlete: 6 to 8 breaths per minute

Although respiration is mostly spontaneous, voluntary muscles may also be used to breathe. When a person focuses on breathing, the rate of respiration is often altered. Therefore, to prevent a patient from inadvertently altering the true rate, try to conceal the fact that respirations are being counted. For example, respiration can be measured without a person's knowledge by observing and counting breaths after taking the pulse.

In addition to measuring respirations, it is also important to observe the patterns of the respirations. Respiratory patterns are defined as follows:

* **Abdominal:** respirations using primarily the abdominal muscles while the chest is mostly still
* **Apnea:** the cessation of breathing; may be temporary or permanent
* **Bradypnea:** breathing that is abnormally slow
* **Cheyne-Stokes respiration:** a grossly irregular breathing pattern composed of intermittent periods of apnea lasting from 10 to 60 seconds followed by periods of fast and slow breathing
* **Decreased:** very little air movement in the lungs
* **Dyspnea:** difficult or painful breathing; shortness of breath
* **Hyperpnea or tachypnea:** breathing that is faster or deeper than that which is produced during normal activity. Also known as hyperventilation
* **Kussmaul's breathing:** deep, gasping respirations; *air hunger*
* **Labored breathing:** difficult breathing that uses shoulder muscles, neck muscles, and abdominal muscles

The volume of air that is exchanged with each respiration can be determined by placing one hand on the patient's chest and feeling the chest rise and fall. The volume of respirations can be described as deep or shallow (restricted). When respirations are deep, the patient takes long, deep breaths. A prolonged inspiration might indicate an upper airway obstruction, or a prolonged expiration could indicate chronic obstructive pulmonary disease (COPD), like asthma, bronchitis, or emphysema. If the breathing is shallow, shock may be indicated. Irregular breathing or gasping may indicate cardiac involvement. Under normal circumstances breathing (respiration) is quiet and effortless. Noisy respirations indicate an obstruction in the air passages.

Patients who are having difficulty breathing usually will sit up and lean forward in an effort to breathe easier. The first signs of oxygen deprivation are mental confusion and restlessness. A person who is experiencing these symptoms must be seen immediately by the physician.

MEASURING RESPIRATION

Materials Needed:

- a digital watch or analog watch with a second hand
- gloves (if blood or other body fluids are present)

1. **Procedural Step:** Measure the respiration after obtaining the patient's pulse.

   Reason: To prevent the patient from knowing when breaths are being counted.

2. **Procedural Step:** Wash your hands if possible.

   Reason: Universal Precaution.

3. **Procedural Step:** Wear gloves if blood or other body fluid is present.

   Reason: Universal Precaution.

4. **Procedural Step:** If in an inpatient setting, identify the patient or client by asking the person for the first and last name. Repeat the full name back to the patient.

   Reason: To make sure you are working with the correct person.

5. **Procedural Step:** Do not tell the patient when you will be monitoring the respiratory rate.

   Reason: This could alter the results.

6. **Procedural Step:** If you measured the radial pulse, keep the patient's arm across the chest and count one inspiration and one expiration as one breath.

   Reason: Having the patient's arm in this position will make it easier to detect the rise and fall of the patient's chest.

7. **Procedural Step:** Count the rate for 30 seconds and multiply that number by 2. This final value will be the number of breaths per minute (i.e., if you count eight full respirations in 30 seconds, multiply $8 \times 2 = 16$ breaths per minute).

   Reason: Respiration is documented as the breaths per minute.

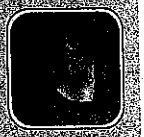
8. **Procedural Step:** Remove and discard your gloves if it was necessary to put them on.

   Reason: Universal Precaution.

9. **Procedural Step:** Wash your hands.

   Reason: Universal Precaution.

10. **Procedural Step:** Record the results on the patient's chart.



    Reason: To provide documentation.

11. **Procedural Step:** Report any difficulty in breathing to your supervisor or activate the EMS and note it on the patient's chart.

    Reason: Difficulty in breathing indicates a health problem.

    Chart it like this: *R = 16, labored.*

BLOOD PRESSURE

Blood pressure is a measurement of the pressure of the blood exerted against the walls of the arteries. This pressure is recorded as two measurements: systolic and diastolic. The systolic pressure is the top number in a blood pressure reading. It reflects the blood pressure when the heart contracts. The diastolic pressure reflects the blood pressure when the heart is at rest and is recorded as the bottom number of a blood pressure measurement. For example, if a person has a systolic pressure of 120 and a diastolic pressure of 80, the blood pressure would be recorded as 120/80.

blood pressure
the pressure exerted by the circulating blood against the walls of the arteries.

The blood pressure is affected by a number of factors, such as the amount of blood and other fluids that are present in the body, the condition of the arteries, and the force of the heartbeat. These factors, in turn, can be affected by many other considerations. Age, exercise, obesity, food, pain, stress, stimulants, steroids, and some medications can cause the blood pressure to increase; whereas weight loss, fasting, depression, and blood loss can lower the blood pressure. Gender and heredity can also influence a person's blood pressure. For example, premenopausal women tend to have blood pressure measurements that are approximately 10 mm Hg lower than men. Similarly, a person's chances of having low blood pressure or high blood pressure increase if one or both parents suffered from the condition.

Although blood pressure increases during exercise, an exercise program helps to lower blood pressure overall. The heart beats (or works) as fast as it needs to in order to get blood, oxygen, and nutrients to the entire body. A strong, healthy heart that pumps efficiently allows blood to circulate throughout the body at a lower pressure than a heart that is in poor condition and has to work harder to perform the same function. This is why trained athletes tend to have lower blood pressure than average people. Physical training increases the heart's pumping efficiency and improves the health of the peripheral vascular system.

The blood pressure measurement is a source of valuable information for the health care provider. Specific abnormalities in blood pressure are indications of various health problems. If a positive result is obtained, meaning that the blood pressure is either too high or too low, experienced medical assistance should be sought immediately.

Positive test results:

1. A systolic value below 100 mm Hg or above 139 mm Hg
2. A diastolic value below 65 mm Hg or above 89 mm Hg

Implications:

1. Low blood pressure (hypotension) may indicate shock, dehydration, or internal injury. Possible causes might be heart failure, heat exhaustion or heatstroke, diabetes, or liver disease.
2. High blood pressure (hypertension) can be a dangerous precursor to cardiac problems and strokes. High blood pressure can exert extreme pressure on blood vessels, including the vascular regions of the brain. Possible causes might be obesity, lack of physical activity, too much salt in diet, and stress.

In emergency situations, blood pressure should be measured as soon as possible, and the information should be given to EMS personnel when they arrive. If the blood pressure cannot be obtained, activate the EMS or find someone who can take a proper reading.

To measure a person's blood pressure, a sphygmomanometer (blood pressure cuff) and a stethoscope will be needed. To get an accurate reading, the width of the sphygmomanometer should cover approximately three-fourths of the patient's upper arm. If the cuff is too narrow, a false high reading can be obtained, and a cuff that is too wide can produce a false low reading (see Figure 12-2).

FIGURE 12-2 The width of the blood pressure cuff can affect the accuracy of the measurement. Make sure the sphygmomanometer is the proper size for the patient.

AUSCULTATING A BLOOD PRESSURE

Materials Needed:

* a stethoscope
* a sphygmomanometer (in the proper size for the patient)
* an alcohol sponge
* gloves (if blood or other body fluids are present)

1. **Procedural Step:** Wash your hands and assemble the equipment.

Reason: Universal Precaution

2. **Procedural Step:** Put on gloves if there is any blood or other body fluid present.

Reason: Universal Precaution

3. **Procedural Step:** If in an inpatient setting, identify the patient or client by asking the person for the first and last name. Repeat the full name back to the patient.

Reason: To make sure you are working with the correct person.

4. **Procedural Step:** Explain the procedure using terms the patient can understand.

AUSCULTATING A BLOOD PRESSURE

Reason: This keeps the patient calm and provides the information necessary for the patient to give informed consent.

5. **Procedural Step:** Have the patient sit or lie down. Roll the patient's sleeve about 6 inches above the elbow. If the sleeve is too tight, remove the arm from the sleeve. Extend the arm, palm up, at heart level.

   Reason: A sleeve that is too tight may compress the brachial artery and distort the results. If the arm is above heart level, the reading may be incorrectly low.

6. **Procedural Step:** Palpate the brachial artery on the inner aspect of the elbow. Then place the blood pressure cuff smoothly and securely around the patient's arm about 2 inches above the bend in the elbow. Be sure the middle of the cloth-enclosed cuff is directly over the brachial artery on the inner aspect of the upper arm. If the cuff has an arrow to indicate right or left arm, the arrow should be placed over the brachial artery.

   Reason: The cuff should be tight enough to stay on, but not so tight as to be constricting. It should be high enough so that the stethoscope will not touch the cuff and cause extraneous sounds. By placing the center of the bladder of the cuff over the brachial artery you assure that the pressure is applied equally over the artery.

7. **Procedural Step:** Place the earpieces of the stethoscope in your ears with the tips pointing slightly forward. Avoid letting the tubes rub together.

   Reason: The forward position of the earpieces will make it easier to hear because they will be following the direction of the ear canal. The tubes should be hanging freely so extraneous sounds won't be heard.

8. **Procedural Step:** Palpate the pulse at the brachial artery. Place the diaphragm of the stethoscope firmly over the point of maximal impulse (PMI).

   Reason: Proper placement of the diaphragm will help you hear the sounds of the blood pressure.

9. **Procedural Step:** Hold the diaphragm in place with your nondominant hand, close the control valve, and quickly squeeze the bulb with your dominant hand until you can no longer hear the pulse.

   Reason: The range of 20 to 30 mm Hg is sufficient to be sure you have pumped the cuff high enough to accurately hear the systolic pressure. Inflating the rubber bladder in the cuff stops the flow of blood in the artery. The cuff is inflated quickly and smoothly to avoid congestion in the blood vessels.

10. **Procedural Step:** Slowly and steadily open the control valve at a rate of approximately 2 to 3 mm Hg per heartbeat. This will release the air in the cuff. Listen for the first clear, tapping sound. This is the systolic pressure. Notice the reading on the calibrated scale.

    Reason: The systolic blood pressure represents the pressure against the walls of the arteries when the ventricles of the heart contract and blood surges through the aorta and pulmonary arteries.

(continues)

AUSCULTATING A BLOOD PRESSURE (Continued)

11. **Procedural Step:** Continue to steadily deflate the cuff until the last sound is heard. This is the diastolic pressure.

    Reason: The diastolic pressure refers to the point at which there is the least pressure in the arteries and occurs when the heart relaxes (diastole) before the next contraction (systole).

12. **Procedural Step:** Quickly release the rest of the air from the cuff and remove the cuff from the patient's arm.

    Reason: If left inflated, it will prevent circulation to the hand and arm.

13. **Procedural Step:** Report any abnormalities to your supervisor or activate the EMS. Immediately record the measurements obtained as a fraction, noting the time, arm used (right or left), and the patient's position (lying, sitting, or standing).

    Reason: Abnormalities may indicate a health problem. Charting immediately will ensure accuracy.

14. **Procedural Step:** If you have trouble obtaining a reading on one arm, take a reading on the opposite arm and report the problem on the chart.

    Reason: An abnormality may indicate a problem with one of the arteries.

15. **Procedural Step:** Clean the earpieces and the diaphragm of the stethoscope with an alcohol sponge.

    Reason: The equipment will be ready for use the next time.

16. **Procedural Step:** Remove your gloves and discard if it was necessary to put them on.

    Reason: Universal Precaution.

17. **Procedural Step:** Wash your hands before giving care to another patient.

    Reason: Universal Precaution.

Chart the blood pressure like this, indicating which arm was used and whether the patient was sitting or lying down: *BP = 160/90 RA, sitting* meaning the blood pressure was 160 mm Hg systolic and 90 mm Hg diastolic, and the reading was taken on the right arm with the patient in a sitting position.

NOTE: When listening for the diastolic pressure, you will notice a change in the quality of the sounds before they completely disappear. Some physicians consider this first diastolic sound to be the diastolic blood pressure. If you are asked to record this sound, chart it as follows: *B/P 180/100/90*. This would mean that the first sound you heard was 180 (systolic blood pressure), a change or muffled sound was noted at 100 (first diastolic sound), and the last sound you heard was at 90 (final diastolic pressure).

THINKING IT THROUGH

At Valley Community College the beginning of soccer season signals the need for every player to have a physical exam. It typically takes the entire athletic training staff all morning to perform the necessary physicals, and this year promised to be no different.

On the date set for the physicals Ms. Morgan, the head athletic trainer, set up a different station for each vital sign. She then assigned athletic training students to each station. Steve was assigned to take blood pressures, and he was doing a good job of it. Ms. Morgan was getting the same pressures as he was nine out of 10 times.

One of Steve's friends, Rudy, was in line to have his blood pressure taken. To Steve's surprise, Rudy's blood pressure was 170 over 92. Steve did not know how to tell a friend that his blood pressure would jeopardize his chance to play soccer. So, Ms. Morgan and Steve sat down with Rudy to discuss his unusually high blood pressure. Rudy assured them that he had a condition called "White Coat Syndrome," in which he gets nervous when someone takes his blood pressure. He promised to have his family physician check him out and forward the results to the school's athletic department.

Why is it important for an athletic trainer to check the athletic training student's work periodically? How elevated is Rudy's blood pressure when compared to the normal range? Is it acceptable to have a family physician perform the physical and forward the results instead of having it performed by the athletic training staff?

TEMPERATURE

core temperature

the internal body temperature.

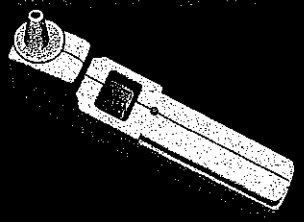
The body's **core temperature** must remain within a relatively narrow range in order for the body's various systems to function efficiently. The body's temperature is regulated by an area in the brain known as the hypothalamus. This important group of cells monitors the temperature of the blood and stimulates a response to compensate for any changes in temperature that occur. For example, heat is normally produced as we burn calories obtained from the food we eat. If this fails to produce enough heat, the hypothalamus will compensate for the lack of heat by sending a message (via the nerves) to the muscles to create heat by shivering. The hypothalamus also causes the blood vessels in the skin to constrict so that the body's heat can be retained. Similarly, if the body generates too much heat, the sweat glands are stimulated, and the blood vessels are dilated to promote the loss of heat.

Normal body temperature is 98.6° Fahrenheit (37° Celsius). Oral temperature reading is the preferred method for obtaining a patient's temperature. However, for those who work in the field, it is often more practical to take a temperature reading of the tympanic membrane (the membrane that covers the eardrum) using a digital

ear thermometer called a tympanic thermometer. The tympanic membrane shares the same blood supply as the hypothalamus, the portion of the brain that controls the body's temperature. The temperature reading obtained from the tympanic membrane is actually the temperature of the blood flowing through the tympanic membrane. The thermometer's speculum is inserted into the patient's ear next to the tympanic membrane. Within seconds, the thermometer provides a read-out of the patient's temperature. *Be careful not to insert the probe too far—this can injure the tympanic membrane!*

There are two temperature scales that are used to assess a patient's temperature: Fahrenheit and Celsius. Proper measurement of the body's core temperature can help identify changes in the patient's condition. The following pages describe the correct procedures for taking a patient's temperature using tympanic and oral thermometers.

MEASURING A TYMPANIC TEMPERATURE USING A TYMPANIC THERMOMETER



Materials Needed:

* a tympanic thermometer (electronic)
* a disposable thermometer cover
* gloves (if blood or other body fluids are present)

1. **Procedural Step:** Wash your hands.

Reason: Universal Precaution.

2. **Procedural Step:** Put on gloves if any blood or other body fluid is present.

Reason: Universal Precaution.

3. **Procedural Step:** If in an inpatient setting, identify the patient or client by asking the person for the first and last name. Repeat the full name back to the patient.

Reason: To make sure you are working with the correct person.

4. **Procedural Step:** Explain the procedure using terms the patient can understand.

Reason: This reassures the patient and provides information necessary for the patient to give informed consent.

5. **Procedural Step:** Remove the thermometer from your kit.

Reason: The device is portable.

6. **Procedural Step:** Place the disposable cover over the ear speculum.

Reason: Clean technique.

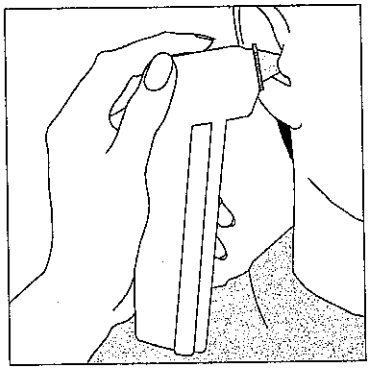
7. **Procedural Step:** Have the patient turn the head to one side. If the patient is a child, gently turn the head to one side and hold it in place.

Reason: This makes the ear easily accessible.

8. **Procedural Step:** Place the speculum in either ear canal for 5 seconds. It only has to cover the opening!

MEASURING A TYMPANIC TEMPERATURE USING A TYMPANIC THERMOMETER

Reason: This measures the temperature of the tympanic membrane.



9. **Procedural Step:** Press the scan button, and release it when the temperature is flashing on the display screen.

   Reason: The signal indicates the thermometer is ready to be read. It usually takes about 2 seconds.

10. **Procedural Step:** Remove the thermometer from the patient's ear.

    Reason: The temperature has been obtained.

11. **Procedural Step:** Read the thermometer and discard the disposable cover.

    Reason: Universal Precaution.

12. **Procedural Step:** Remove and discard your gloves if it was necessary to wear them.

    Reason: Universal Precaution.

13. **Procedural Step:** Wash your hands.

    Reason: Universal Precaution.

14. **Procedural Step:** Return the thermometer to your kit.

    Reason: It will be ready for use the next time.

15. **Procedural Step:** Chart the temperature.

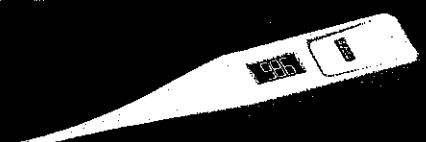
    Reason: To provide documentation. 98.6°F is normal.

    Chart it like this: *T = 98°* or *T = 98.4.*

MEASURING AN ORAL TEMPERATURE USING A DIGITAL THERMOMETER

Materials Needed:

* a digital thermometer
* a disposable thermometer cover
* gloves (if blood or other body fluids are present)



1. **Procedural Step:** Wash your hands if possible.

   Reason: Universal Precaution.

2. **Procedural Step:** Put on gloves if blood or other body fluids are present.

   Reason: Universal Precaution.

(continues)

MEASURING AN ORAL TEMPERATURE USING A DIGITAL THERMOMETER (Continued)

3. **Procedural Step:** If in an inpatient setting, identify the patient or client by asking the person for the first and last name. Repeat the full name back to the patient.

   Reason: To make sure you are working with the correct person.

4. **Procedural Step:** Explain the procedure using terms the patient can understand.

   Reason: This keeps the patient calm and provides information the patient needs to give informed consent.

5. **Procedural Step:** Remove the thermometer from your kit and place a disposable cover over the probe.

   Reason: To avoid contamination.

6. **Procedural Step:** Have the patient discard anything in the mouth.

   Reason: It may affect the temperature reading.

7. **Procedural Step:** Ask if the patient has had anything by mouth within the last 15 minutes. If so, wait 15 minutes more.

   Reason: It may affect the temperature reading.

8. **Procedural Step:** Wait for the *ready* signal to be displayed on the thermometer.

   Reason: This means the thermometer is ready for use.

9. **Procedural Step:** Place the probe in the patient's mouth under the tongue. Have the patient close the lips.

   Reason: This area is close to a rich blood supply.

10. **Procedural Step:** At the sound or flashing light, remove the probe from the patient's mouth.

    Reason: The signal indicates the thermometer is ready to read.

11. **Procedural Step:** Without touching the portion of the cover that was in the patient's mouth, dispose of the cover.

    Reason: This allows removal of the probe cover without touching it and prevents alteration of the thermometer reading.

12. **Procedural Step:** Remove and discard your gloves if it was necessary to put them on.

    Reason: Universal Precaution.

13. **Procedural Step:** Wash your hands.

    Reason: Universal Precaution.

14. **Procedural Step:** Read the display. Record the temperature on the patient's chart.

    Reason: To provide documentation.

MEASURING AN ORAL TEMPERATURE USING A DIGITAL THERMOMETER

15. **Procedural Step:** Return the thermometer to the kit.

    Reason: The equipment will be ready for the next use.

16. **Procedural Step:** Immediately report any abnormalities to your supervisor or contact the EMS.

    Reason: This may indicate a health problem. A normal oral temperature is 98.6°F.

    Chart it like this: $T = 98^{6}$ or $T = 98.6$.

WEIGHT AND HEIGHT

Most people want to achieve a certain weight so that they will look and feel attractive. But there are health reasons for maintaining a particular weight, too. Excess weight or fat can contribute to a variety of health risks. Some of these risks are listed below:

* Increased risk of cardiovascular disease because of additional stress on the heart, and heightened risk of hypertension and atherosclerosis
* Decreased life expectancy
* Impeded circulation in the legs
* Increased risk of diabetes
* Increased stress on muscles and joints supporting the extra weight

Since weight is such an important factor in maintaining good health, a person's height and weight are almost always measured in the course of a physical examination. The following pages contain the proper procedures for measuring weight and height.

MEASURING THE WEIGHT OF AN ADULT

Materials Needed:

* a scale with a measuring device

1. **Procedural Step:** If in an inpatient setting, identify the patient or client by asking the person for the first and last name. Repeat the full name back to the patient.

   Reason: To make sure you are working with the correct person.

(continues)

MEASURING THE WEIGHT OF AN ADULT (Continued)

2. **Procedural Step:** Ask if the patient knows his or her weight.

   Reason: This will assist you in setting the weight on the scale in the general area; it also avoids embarrassment if you misjudge the patient at a too-heavy weight.

3. **Procedural Step:** Ask the patient to remove any heavy outer wear such as coats and sweaters. The shoes may be removed too.

   Reason: Clothing and footwear can add 3 to 6 pounds.

4. **Procedural Step:** Make sure both the weights on the scale are pushed completely to the left, at the *zero* position. The scale must be on a flat, balanced surface.

   Reason: To prevent an inaccurate reading.

5. **Procedural Step:** If the patient is barefoot (as may be the case in an inpatient setting), place a paper on the scale to stand on.

   Reason: Clean technique.

6. **Procedural Step:** Inform the patient the scale may move and assist the patient onto the scale by gently taking an arm for extra support.

   Reason: To prevent the patient from falling.

7. **Procedural Step:** Always be ready to physically assist the patient. Constantly watch for any unsteadiness.

   Reason: To prevent a fall if the patient loses balance.

8. **Procedural Step:** Instruct the patient to stand still, with arms at sides. The patient should not hold on to any part of the scale or you.

   Reason: If the patient touches you, the scale, or anything else, some of the weight will be displaced, causing an inaccurate reading.

9. **Procedural Step:** The bottom weight on the scale marks increments of 50 pounds. Slide this weight to the mark (50, 100, 150, or 200) that is closest to, but not over, the patient's stated weight. Make sure the weight rests securely in the incremental groove on the register.

   Reason: Unless this bottom weight is properly set, your measurement may be off by several pounds.

10. **Procedural Step:** Gradually move the upper weight, which indicates individual pounds, across the upper register until the pointer on the right end of the set of registers rests in the center of the metal frame. The registers should not touch the sides of the frame.

    Reason: When the set of registers balances in the center of the metal frame, the scale is set to the patient's correct weight.

MEASURING THE WEIGHT OF AN ADULT

11. **Procedural Step:** Assist the patient from the scale.

    Reason: To prevent the patient from falling.

12. **Procedural Step:** Return the weights to the *zero* setting.

    Reason: To prepare the scale for the next patient.

13. **Procedural Step:** Record the patient's weight in pounds.

    Reason: To provide documentation.

14. **Procedural Step:** Remove and discard the paper if it was necessary to place one on the scale.

    Reason: Clean technique.

    Chart it like this: *9:00 a.m. 150 lbs.*

MEASURING THE HEIGHT OF AN ADULT

Materials Needed:

* a scale with a measuring device

1. **Procedural Step:** If in an inpatient setting, identify the patient or client by asking the person for the first and last name. Repeat the full name back to the patient.

    Reason: To make sure you are working with the correct person.

2. **Procedural Step:** Have the patient remove shoes and step on the scale, facing away from it.

    Reason: To obtain the most accurate measurement. Shoes can substantially alter a person's height reading.

3. **Procedural Step:** With the hinged arm in the lowered position, raise the height bar above the patient's head.

    Reason: To prevent the arm from injuring the patient.

4. **Procedural Step:** Instruct the patient to look straight ahead.

    Reason: This will keep the top of the head level.

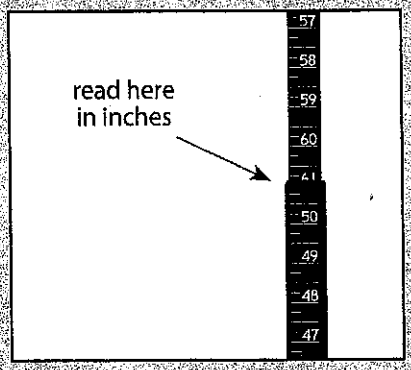
5. **Procedural Step:** Extend the hinged arm and gently slide the measuring bar down until it rests lightly on the patient's head.

(continues)

MEASURING THE HEIGHT OF AN ADULT (Continued)

Reason: If done too quickly, the patient may be injured.

6. **Procedural Step:** Read the last digit or fraction of a digit that is visible on the moveable portion of the bar, just above the stationary portion.



Reason: This is the patient's height.

7. **Procedural Step:** Record the patient's height in inches. If the patient wants to know the height in feet, remember that 12 inches = 1 foot. Therefore, a person with a height of 72 inches is 6 feet tall.

Reason: To provide documentation.

Chart it like this: *9:00 a.m. 60¾ ins.*

CHAPTER SUMMARY

One of the most valuable skills a health care provider can learn is how to measure a patient's vital signs properly. The four basic vital signs include the pulse, respiratory rate, blood pressure, and temperature. There are specific procedures for obtaining accurate measurements of each of these vital signs. Anyone who wants to work in the field of sports medicine must know what these procedures are and be able to perform them quickly and accurately. In addition to being able to obtain accurate measurements, one must be able to use this information to detect changes in the patient's health status. Understanding the factors that can affect each vital sign also will help ensure the quality of care provided to each patient and client.

It is not enough for a health care provider to simply measure and record vital signs; the key to quality care is communication. Many times the sports medicine professional will be the first to arrive at the scene of an injury and will be responsible for passing information to the EMS, physicians, and family members. The importance of good communication in providing high quality health care cannot be overemphasized! This means every sports medicine professional must carefully observe the patient's signs and symptoms, initiate appropriate emergency action, record all vital patient information, and report all the necessary patient information to the appropriate people (i.e., EMS personnel, the patient's physician, and the patient's family).